General

Guideline Title

Venous thromboembolism in adults admitted to hospital: reducing the risk.

Bibliographic Source(s)

National Clinical Guideline Centre for Acute and Chronic Conditions. Venous thromboembolism in adults admitted to hospital: reducing the risk. London (UK): National Institute for Health and Care Excellence (NICE); 2015 Jun. 62 p. (Clinical guideline; no. 92).

Guideline Status

This is the current release of the guideline.

This guideline updates a previous version: National Collaborating Centre for Acute and Chronic Conditions. Venous thromboembolism: reducing the risk. Reducing the risk of venous thromboembolism (deep vein thrombosis and pulmonary embolism) in patients admitted to hospital. London (UK): National Institute for Health and Clinical Excellence (NICE); 2010 Jan. 50 p. (Clinical guideline; no. 92).

This guideline meets NGC's 2013 (revised) inclusion criteria.

Recommendations

Major Recommendations

Note from the National Guideline Clearinghouse (NGC): This guideline was developed by the National Collaborating Centre for Acute and Chronic Conditions (NCC-ACC) on behalf of the National Institute for Health and Care Excellence (NICE). See the "Availability of Companion Documents" field for the full version of this guidance.

The following guidance is based on the best available evidence. The full guideline gives details of the methods and the evidence used to develop the 2010 recommendations. The guideline addendum (see the "Availability of Companion Documents" field) gives details of the methods and the evidence used to develop the 2015 recommendations.

Recommendations are marked as [new 2015] or [2010]:

- [new 2015] indicates that the evidence has been reviewed and the recommendation has been added or updated
- [2010] indicates that the evidence has not been reviewed since 2010.

The wording used in the recommendations in this guideline (for example, words such as 'offer' and 'consider') denotes the certainty with which the recommendation is made (the strength of the recommendation) and is defined at the end of the "Major Recommendations" field.

Assessing the Risks of Venous Thromboembolism (VTE) and Bleeding

Assess all patients on admission to identify those who are at increased risk of VTE. [2010]

Regard medical patients as being at increased risk of VTE if they:

- Have had or are expected to have significantly reduced mobility for 3 days or more or
- Are expected to have ongoing reduced mobility relative to their normal state and have one or more of the risk factors shown in Box 1 below [2010]

Box 1. Risk Factors for VTE

- Active cancer or cancer treatment
- Age over 60 years
- Critical care admission
- Dehydration
- Known thrombophilias
- Obesity (body mass index [BMI] $\geq 30 kg/m^2$)
- One or more significant medical comorbidities (for example: heart disease; metabolic, endocrine or respiratory pathologies; acute infectious diseases; inflammatory conditions)
- Personal history or first-degree relative with a history of VTE
- Use of hormone replacement therapy
- Use of oestrogen-containing contraceptive therapy
- Varicose veins with associated phlebitis

For women who are pregnant or have given birth within the previous 6 weeks, see the "Other Patient Groups" section below.

Regard surgical patients and patients with trauma as being at increased risk of VTE if they meet one of the following criteria:

- Surgical procedure with a total anaesthetic and surgical time of more than 90 minutes, or 60 minutes if the surgery involves the pelvis or lower limb
- Acute surgical admission with inflammatory or intra-abdominal condition
- Expected significant reduction in mobility
- One or more of the risk factors shown in Box 1 above [2010]

Assess all patients for risk of bleeding before offering pharmacological VTE prophylaxis.[1] Do not offer pharmacological VTE prophylaxis to patients with any of the risk factors for bleeding shown in Box 2 below, unless the risk of VTE outweighs the risk of bleeding. [2010]

Reassess patients' risks of bleeding and VTE within 24 hours of admission and whenever the clinical situation changes, to:

- Ensure that the methods of VTE prophylaxis being used are suitable
- Ensure that VTE prophylaxis is being used correctly
- Identify adverse events resulting from VTE prophylaxis [2010]

Box 2. Risk Factors for Bleeding

- Active bleeding
- Acquired bleeding disorders (such as acute liver failure)
- Concurrent use of anticoagulants known to increase the risk of bleeding (such as warfarin with international normalised ratio [INR] higher than 2)
- Lumbar puncture/epidural/spinal anaesthesia expected within the next 12 hours
- Lumbar puncture/epidural/spinal anaesthesia within the previous 4 hours
- Acute stroke
- Thrombocytopenia (platelets less than $75 \times 10^9/L$)
- Uncontrolled systolic hypertension (230/120 mmHg or higher)
- Untreated inherited bleeding disorders (such as haemophilia and von Willebrand's disease)

Reducing the Risk of VTE

Do not allow patients to become dehydrated unless clinically indicated. [2010]

Encourage patients to mobilise as soon as possible. [2010]

Do not regard aspirin or other antiplatelet agents as adequate prophylaxis for VTE. [2010]

Consider offering temporary inferior vena caval filters to patients who are at very high risk of VTE (such as patients with a previous VTE event or an active malignancy) and for whom mechanical and pharmacological VTE prophylaxis are contraindicated. [2010]

Using VTE Prophylaxis

Mechanical VTE Prophylaxis

Base the choice of mechanical VTE prophylaxis on individual patient factors including clinical condition, surgical procedure and patient preference. Choose any one of:

- Anti-embolism stockings (thigh or knee length)
- Foot impulse devices
- Intermittent pneumatic compression devices (thigh or knee length) [2010]

For patients who are admitted for stroke see the "Medical Patients" section below. [2010]

Anti-embolism Stockings

Do not offer anti-embolism stockings to patients who have:

- Suspected or proven peripheral arterial disease
- Peripheral arterial bypass grafting
- Peripheral neuropathy or other causes of sensory impairment
- Any local conditions in which stockings may cause damage, for example fragile 'tissue paper' skin, dermatitis, gangrene or recent skin graft
- Known allergy to material of manufacture
- Cardiac failure
- Severe leg oedema or pulmonary oedema from congestive heart failure
- Unusual leg size or shape
- Major limb deformity preventing correct fit

Use caution and clinical judgement when applying anti-embolism stockings over venous ulcers or wounds. [2010]

Ensure that patients who need anti-embolism stockings have their legs measured and that the correct size of stocking is provided. Anti-embolism stockings should be fitted and patients shown how to use them by staff trained in their use. [2010]

Ensure that patients who develop oedema or postoperative swelling have their legs re-measured and anti-embolism stockings refitted. [2010]

If arterial disease is suspected, seek expert opinion before fitting anti-embolism stockings. [2010]

Use anti-embolism stockings that provide graduated compression and produce a calf pressure of 14–15 mmHg. (This relates to a pressure of 14–18 mmHg at the ankle and is in line with British Standards 6612:1985 Specification for graduated compression hosiery and 7672:1993 Specification for compression, stiffness and labelling of anti-embolism hosiery.) [2010]

Encourage patients to wear their anti-embolism stockings day and night until they no longer have significantly reduced mobility. [2010]

Remove anti-embolism stockings daily for hygiene purposes and to inspect skin condition. In patients with a significant reduction in mobility, poor skin integrity or any sensory loss, inspect the skin two or three times per day, particularly over the heels and bony prominences. [2010]

Discontinue the use of anti-embolism stockings if there is marking, blistering or discolouration of the skin, particularly over the heels and bony prominences, or if the patient experiences pain or discomfort. If suitable, offer a foot impulse or intermittent pneumatic compression device as an alternative. [2010]

Show patients how to use anti-embolism stockings correctly and ensure they understand that this will reduce their risk of developing VTE. [2010]

Monitor the use of anti-embolism stockings and offer assistance if they are not being worn correctly. [2010]

Foot Impulse Devices and Intermittent Pneumatic Compression Devices

Do not offer foot impulse or intermittent pneumatic compression devices to patients with a known allergy to the material of manufacture. [2010]

Encourage patients on the ward who have foot impulse or intermittent pneumatic compression devices to use them for as much of the time as is possible and practical, both when in bed and when sitting in a chair. [2010]

Pharmacological VTE Prophylaxis

Base the choice of pharmacological VTE agents on local policies and individual patient factors, including clinical condition (such as renal failure) and patient preferences. [2010]

Medical Patients

General Medical Patients

Offer pharmacological VTE prophylaxis to general medical patients assessed to be at increased risk of VTE (see "Assessing the Risks of VTE and Bleeding" above). Choose any one of:

- Fondaparinux sodium
- Low molecular weight heparin (LMWH)[2]
- Unfractionated heparin (UFH) (for patients with severe renal impairment of established renal failure)

Start pharmacological VTE prophylaxis as soon as possible after risk assessment has been completed. Continue until the patient is no longer at increased risk of VTE. [2010]

Patients with Stroke

Do not offer anti-embolism stockings for VTE prophylaxis to patients who are admitted for stroke. [2010]

Consider offering prophylactic-dose LMWH[2] (or UFH for patients with severe renal impairment or established renal failure) if:

- A diagnosis of haemorrhagic stroke has been excluded, and
- The risk of bleeding (haemorrhagic transformation of stroke or bleeding into another site) is assessed to be low, and
- The patient has one or more of:
    - Major restriction of mobility
    - Previous history of VTE
    - Dehydration
    - Comorbidities (such as malignant disease)

Continue until the acute event is over and the patient's condition is stable. [2010]

Do not offer foot impulse or neuromuscular electrical stimulation devices for VTE prophylaxis to patients who are admitted for stroke, except in the context of research. [new 2015]

Consider intermittent pneumatic compression for VTE prophylaxis in immobile patients who are admitted within 3 days of acute stroke.

- Explain to the patient or their family members or carers (as appropriate) that:
    - It reduces the risk of deep vein thrombosis (DVT) and may provide an increase in survival
    - It will not help them recover from stroke, and there may be an associated increased risk of surviving with severe disability (see Table 1 in the original guideline document)
- When using intermittent pneumatic compression for patients who are admitted for stroke, provide it for 30 days or until the patient is mobile or discharged, whichever is sooner. [new 2015]

Patients with Cancer

Offer pharmacological VTE prophylaxis to patients with cancer who are assessed to be at increased risk of VTE (see "Assessing the Risks of VTE

and Bleeding" above). Choose any one of:

- Fondaparinux sodium
- LMWH[2]
- UFH (for patients with renal failure)

Start pharmacological VTE prophylaxis as soon as possible after risk assessment has been completed. Continue until the patient is no longer at increased risk of VTE. [2010]

Do not routinely offer pharmacological or mechanical VTE prophylaxis to patients with cancer having oncological treatment who are ambulant. [2010]

Patients with Central Venous Catheters

Do not routinely offer pharmacological or mechanical VTE prophylaxis to patients with central venous catheters who are ambulant. [2010]

Consider offering pharmacological VTE prophylaxis with LMWH[2] (or UFH for patients with severe renal impairment or established renal failure) to patients with central venous catheters who are at increased risk of VTE (see "Assessing the Risks of VTE and Bleeding" above). [2010]

Patients in Palliative Care

Consider offering pharmacological VTE prophylaxis to patients in palliative care who have potentially reversible acute pathology. Take into account potential risks and benefits and the views of patients and their families and/or carers. Choose any one of:

- Fondaparinux sodium
- LMWH[2]
- UFH (for patients with severe renal impairment or established renal failure) [2010]

Do not routinely offer pharmacological or mechanical VTE prophylaxis to patients admitted for terminal care or those commenced on an end-of-life care pathway. [2010]

Review decisions about VTE prophylaxis for patients in palliative care daily, taking into account the views of patients, their families and/or carers and the multidisciplinary team. [2010]

Medical Patients in Whom Pharmacological VTE Prophylaxis Is Contraindicated

Consider offering mechanical VTE prophylaxis to medical patients in whom pharmacological VTE prophylaxis is contraindicated. Choose any one of:

- Anti-embolism stockings (thigh or knee length)
- Foot impulse devices
- Intermittent pneumatic compression devices (thigh or knee length)

For patients who are admitted for stroke see recommendations above. [2010]

Surgical Patients

All Surgery

Advise patients to consider stopping oestrogen-containing oral contraceptives or hormone replacement therapy 4 weeks before elective surgery. If stopped, provide advice on alternative contraceptive methods. [2010]

Assess the risks and benefits of stopping pre-existing established antiplatelet therapy 1 week before surgery. Consider involving the multidisciplinary team in the assessment. [2010]

Consider regional anaesthesia for individual patients, in addition to other methods of VTE prophylaxis, as it carries a lower risk of VTE than general anaesthesia. Take into account patients' preferences, their suitability for regional anaesthesia and any other planned method of VTE prophylaxis. [2010]

If regional anaesthesia is used, plan the timing of pharmacological VTE prophylaxis to minimise the risk of epidural haematoma. If antiplatelet or anticoagulant agents are being used, or their use is planned, refer to the summary of product characteristics for guidance about the safety and timing

of these agents in relation to the use of regional anaesthesia. [2010]

Do not routinely offer pharmacological or mechanical VTE prophylaxis to patients undergoing a surgical procedure with local anaesthesia by local infiltration with no limitation of mobility. [2010]

Cardiac

Offer VTE prophylaxis to patients undergoing cardiac surgery who are not having other anticoagulation therapy and are assessed to be at increased risk of VTE (see "Assessing the Risks of VTE and Bleeding" above).

- Start mechanical VTE prophylaxis at admission. Choose any one of:
  - Anti-embolism stockings (thigh or knee length)
  - Foot impulse device
  - Intermittent pneumatic compression devices (thigh or knee length)

  Continue mechanical VTE prophylaxis until the patient no longer has significantly reduced mobility.

- Add pharmacological VTE prophylaxis for patients who have a low risk of major bleeding, taking into account individual patient factors and according to clinical judgement. Choose one of:
  - LMWH
  - UFH (for patients with severe renal impairment or established renal failure)

  Continue pharmacological VTE prophylaxis until the patient no longer has significantly reduced mobility (generally 5 to 7 days). [2010]

Gastrointestinal, Gynaecological, Thoracic and Urological

Offer VTE prophylaxis to patients undergoing bariatric surgery.

- Start mechanical VTE prophylaxis at admission. Choose any one of:
  - Anti-embolism stockings (thigh or knee length)
  - Foot impulse devices
  - Intermittent pneumatic compression devices (thigh or knee length)

  Continue mechanical VTE prophylaxis until the patient no longer has significantly reduced mobility.

- Add pharmacological VTE prophylaxis for patients who have a low risk of major bleeding, taking into account individual patient factors and according to clinical judgement. Choose any one of:
  - Fondaparinux sodium
  - LMWH
  - UFH (for patients with severe renal impairment or established renal failure)

  Continue pharmacological VTE prophylaxis until the patient no longer has significantly reduced mobility (generally 5 to 7 days). [2010]

Offer VTE prophylaxis to patients undergoing gastrointestinal surgery who are assessed to be at increased risk of VTE (see "Assessing the Risks of VTE and Bleeding" above).

- Start mechanical VTE prophylaxis at admission. Choose any one of:
  - Anti-embolism stockings (thigh or knee length)
  - Foot impulse devices
  - Intermittent pneumatic compression devices (thigh or knee length)

  Continue mechanical VTE prophylaxis until the patient no longer has significantly reduced mobility. [2010]

- Add pharmacological VTE prophylaxis for patients who have a low risk of major bleeding, taking into account individual patient factors and according to clinical judgement. Choose any one of:
  - Fondaparinux sodium
  - LMWH
  - UFH (for patients with severe renal impairment or established renal failure)

  Continue pharmacological VTE prophylaxis until the patient no longer has significantly reduced mobility (generally 5 to 7 days). [2010]

Offer VTE prophylaxis to patients undergoing gynaecological, thoracic or urological surgery who are assessed to be at increased risk of VTE (see "Assessing the Risks of VTE and Bleeding" above).

- Start mechanical VTE prophylaxis at admission. Choose any one of:

- Anti-embolism stockings (thigh or knee length)
- Foot impulse devices
- Intermittent pneumatic compression devices (thigh or knee length)

Continue mechanical VTE prophylaxis until the patient no longer has significantly reduced mobility.

- Add pharmacological VTE prophylaxis for patients who have a low risk of major bleeding, taking into account individual patient factors and according to clinical judgement. Choose one of:
  - LMWH
  - UFH (for patients with severe renal impairment or established renal failure)

  Continue pharmacological VTE prophylaxis until the patient no longer has significantly reduced mobility (generally 5 to 7 days). [2010]

Extend pharmacological VTE prophylaxis to 28 days postoperatively for patients who have had major cancer surgery in the abdomen or pelvis. [2010]

Neurological (Cranial or Spinal)

Offer VTE prophylaxis to patients undergoing cranial or spinal surgery who are assessed to be at increased risk of VTE (see "Assessing the Risks of VTE and Bleeding" above).

- Start mechanical VTE prophylaxis at admission. Choose any one of:
  - Anti-embolism stockings (thigh or knee length)
  - Foot impulse devices
  - Intermittent pneumatic compression devices (thigh or knee length)

  Continue mechanical VTE prophylaxis until the patient no longer has significantly reduced mobility.

- Add pharmacological VTE prophylaxis for patients who have a low risk of major bleeding, taking into account individual patient factors and according to clinical judgement. Choose one of:
  - LMWH
  - UFH (for patients with severe renal impairment or established renal failure)

  Continue pharmacological VTE prophylaxis until the patient no longer has significantly reduced mobility (generally 5 to 7 days). [2010]

Do not offer pharmacological VTE prophylaxis to patients with ruptured cranial or spinal vascular malformations (for example, brain aneurysms) or acute traumatic or non-traumatic haemorrhage until the lesion has been secured or the condition is stable. [2010]

Orthopaedic Surgery – Elective Hip Replacement, Elective Knee Replacement and Hip Fracture

The summaries of product characteristics state postoperative start times for dabigatran, rivaroxaban and fondaparinux, and preoperative start times for most LMWHs, although individual start times vary depending on the specific LMWH. In this guideline it is recommended that LMWH is started postoperatively, which is off-label use, because of concerns about the risk of bleeding into the joint. Patients would be protected preoperatively by mechanical VTE prophylaxis. [2010]

Elective Hip Replacement

Offer combined VTE prophylaxis with mechanical and pharmacological methods to patients undergoing elective hip replacement surgery.

- Start mechanical VTE prophylaxis at admission. Choose any one of the following, based on individual patient factors:
  - Anti-embolism stockings (thigh or knee length), used with caution (see "Using VTE Prophylaxis" above)
  - Foot impulse devices
  - Intermittent pneumatic compression devices (thigh or knee length)

  Continue mechanical VTE prophylaxis until the patient no longer has significantly reduced mobility.

- Provided there are no contraindications, start pharmacological VTE prophylaxis after surgery. Choose any one of:
  - Dabigatran etexilate, starting 1 to 4 hours after surgery[3]
  - Fondaparinux sodium, starting 6 hours after surgical closure provided haemostasis has been established
  - LMWH, starting 6 to 12 hours after surgery
  - Rivaroxaban, starting 6 to 10 hours after surgery[4]
  - UFH (for patients with severe renal impairment or established renal failure), starting 6 to 12 hours after surgery

  Continue pharmacological VTE prophylaxis for 28 to 35 days, according to the summary of product characteristics for the individual agent

being used. [2010]

Elective Knee Replacement

Offer combined VTE prophylaxis with mechanical and pharmacological methods to patients undergoing elective knee replacement surgery.

- Start mechanical VTE prophylaxis at admission. Choose any one of the following, based on individual patient factors:
  - Anti-embolism stockings (thigh or knee length), used with caution (see "Using VTE Prophylaxis" above)
  - Foot impulse devices
  - Intermittent pneumatic compression devices (thigh or knee length)

  Continue mechanical VTE prophylaxis until the patient no longer has significantly reduced mobility.

- Provided there are no contraindications, start pharmacological VTE prophylaxis after surgery. Choose any one of:
  - Dabigatran etexilate, starting 1 to 4 hours after surgery[3]
  - Fondaparinux sodium, starting 6 hours after surgical closure provided haemostasis has been established
  - LMWH, starting 6 to 12 hours after surgery
  - Rivaroxaban, starting 6 to 10 hours after surgery[4]
  - UFH (for patients with severe renal impairment or established renal failure), starting 6 to 12 hours after surgery

  Continue pharmacological VTE prophylaxis for 10 to 14 days, according to the summary of product characteristics for the individual agent being used. [2010]

Hip Fracture

Offer combined VTE prophylaxis with mechanical and pharmacological methods to patients undergoing hip fracture surgery.

- Start mechanical VTE prophylaxis at admission. Choose any one of the following, based on individual patient factors:
  - Anti-embolism stockings (thigh or knee length), used with caution (see "Using VTE Prophylaxis" above)
  - Foot impulse devices
  - Intermittent pneumatic compression devices (thigh or knee length)

  Continue mechanical VTE prophylaxis until the patient no longer has significantly reduced mobility.

- Provided there are no contraindications, add pharmacological VTE prophylaxis. Choose any one of:
  - Fondaparinux sodium, starting 6 hours after surgical closure, provided haemostasis has been established and there is no risk of bleeding (see Box 2 above)
  - LMWH, starting at admission, stopping 12 hours before surgery and restarting 6 to 12 hours after surgery
  - UFH (for patients with renal failure), starting at admission, stopping 12 hours before surgery and restarting 6 to 12 hours after surgery

  Continue pharmacological VTE prophylaxis for 28 to 35 days, according to the summary of product characteristics for the individual agent being used. [2010]

Fondaparinux sodium is not recommended for use preoperatively for patients undergoing hip fracture surgery. If it has been used preoperatively it should be stopped 24 hours before surgery and restarted 6 hours after surgical closure, provided haemostasis has been established and there is no risk of bleeding (see Box 2 above). [2010]

Other Orthopaedic Surgery

Consider offering combined VTE prophylaxis with mechanical and pharmacological methods to patients having orthopaedic surgery (other than hip replacement, knee replacement or hip fracture surgery) based on an assessment of risks (see "Assessing the Risks of VTE and Bleeding" above) and after discussion with the patient.

- Start mechanical VTE prophylaxis at admission. Choose one of the following, based on individual patient factors:
  - Anti-embolism stockings (thigh or knee length), used with caution (see "Using VTE Prophylaxis" above)
  - Foot impulse devices
  - Intermittent pneumatic compression devices (thigh or knee length)

  Continue mechanical VTE prophylaxis until the patient no longer has significantly reduced mobility.

- Start pharmacological VTE prophylaxis 6 to 12 hours after surgery. Choose one of:
  - LMWH
  - UFH (for patients with severe renal impairment or established renal failure)

Continue pharmacological VTE prophylaxis until the patient no longer has significantly reduced mobility. [2010]

Do not routinely offer VTE prophylaxis to patients undergoing upper limb surgery. If a patient is assessed to be at increased risk of VTE (see "Assessing the Risks of VTE and Bleeding" above), refer to the previous recommendation. [2010]

Vascular

Offer VTE prophylaxis to patients undergoing vascular surgery who are not having other anticoagulant therapy and are assessed to be at increased risk of VTE (see "Assessing the Risks of VTE and Bleeding" above). If peripheral arterial disease is present, seek expert opinion before fitting anti-embolism stockings.

- Start mechanical VTE prophylaxis at admission. Choose any one of:
  - Anti-embolism stockings (thigh or knee length)
  - Foot impulse devices
  - Intermittent pneumatic compression devices (thigh or knee length)

  Continue mechanical VTE prophylaxis until the patient no longer has significantly reduced mobility.

- Add pharmacological VTE prophylaxis for patients who have a low risk of major bleeding, taking into account individual patient factors and according to clinical judgement. Choose one of:
  - LMWH
  - UFH (for patients with severe renal impairment or established renal failure)

  Continue pharmacological VTE prophylaxis until the patient no longer has significantly reduced mobility (generally 5 to 7 days). [2010]

Day Surgery

Offer VTE prophylaxis to patients undergoing day surgery who are assessed to be at increased risk of VTE (see "Assessing the Risks of VTE and Bleeding" above).

- Start mechanical VTE prophylaxis at admission. Choose any one of:
  - Anti-embolism stockings (thigh or knee length)
  - Foot impulse devices
  - Intermittent pneumatic compression devices (thigh or knee length)

  Continue mechanical VTE prophylaxis until the patient no longer has significantly reduced mobility.

- Add pharmacological VTE prophylaxis for patients who have a low risk of major bleeding, taking into account individual patient factors and according to clinical judgement. Choose any one of:
  - Fondaparinux
  - LMWH
  - UFH (for patients with renal failure)

  If the patient is expected to have significantly reduced mobility after discharge, continue pharmacological VTE prophylaxis, generally for 5 to 7 days. [2010]

Other Surgical Patients

Offer VTE prophylaxis to patients undergoing surgery who are assessed to be at increased risk of VTE (see "Assessing the Risks of VTE and Bleeding" above).

- Start mechanical VTE prophylaxis at admission. Choose any one of:
  - Anti-embolism stockings (thigh or knee length)
  - Foot impulse devices
  - Intermittent pneumatic compression devices (thigh or knee length)

  Continue mechanical VTE prophylaxis until the patient no longer has significantly reduced mobility.

- Add pharmacological VTE prophylaxis for patients who have a low risk of major bleeding, taking into account individual patient factors and according to clinical judgement. Choose one of:
  - LMWH
  - UFH (for patients with severe renal impairment or established renal failure)

  Continue pharmacological VTE prophylaxis until the patient no longer has significantly reduced mobility (generally 5 to 7 days). [2010]

Other Patient Groups

Major Trauma

Offer combined VTE prophylaxis with mechanical and pharmacological methods to patients with major trauma. Regularly reassess the patient's risks of VTE and bleeding.

- Start mechanical VTE prophylaxis at admission or as early as clinically possible. Choose any one of:
  - Anti-embolism stockings (thigh or knee length), used with caution (see "Using VTE Prophylaxis" above)
  - Foot impulse devices
  - Intermittent pneumatic compression devices (thigh or knee length)

  Continue mechanical VTE prophylaxis until the patient no longer has significantly reduced mobility.

- If the benefits of reducing the risk of VTE outweigh the risks of bleeding (see Box 2 above) and the bleeding risk has been established as low, add pharmacological VTE prophylaxis. Choose one of:
  - LMWH
  - UFH (for patients with several renal impairment or established renal failure)

  Continue pharmacological VTE prophylaxis until the patient no longer has significantly reduced mobility. [2010]

Spinal Injury

Offer combined VTE prophylaxis with mechanical and pharmacological methods to patients with spinal injury. Regularly reassess the patient's risks of VTE and bleeding.

- Start mechanical VTE prophylaxis at admission or as early as clinically possible. Choose any one of:
  - Anti-embolism stockings (thigh or knee length), used with caution (see "Using VTE Prophylaxis" above)
  - Foot impulse devices
  - Intermittent pneumatic compression devices (thigh or knee length)

  Continue mechanical VTE prophylaxis until the patient no longer has significantly reduced mobility.

- If the benefits of reducing the risk of VTE outweigh the risks of bleeding (see Box 2 above) and the bleeding risk has been established as low, add pharmacological VTE prophylaxis. Choose one of:
  - LMWH
  - UFH (for patients with severe renal impairment or established renal failure)

  Continue pharmacological VTE prophylaxis until the patient no longer has significantly reduced mobility. [2010]

Lower Limb Plaster Casts

Consider offering pharmacological VTE prophylaxis to patients with lower limb plaster casts after evaluating the risks (see "Assessing the Risks of VTE and Bleeding" above) and benefits based on clinical discussion with the patient. Offer LMWH (or UFH for patients with severe renal impairment of established renal failure) until lower limb plaster cast removal. [2010]

Pregnancy and Up to 6 Weeks Postpartum

Consider offering pharmacological VTE prophylaxis with LMWH (or UFH for patients with severe renal impairment or established renal failure) to women who are pregnant or have given birth within the previous 6 weeks who are admitted to hospital but are not undergoing surgery, and who have one or more of the following risk factors:

- Expected to have significantly reduced mobility for 3 or more days
- Active cancer or cancer treatment
- Age over 35 years
- Critical care admission
- Dehydration
- Excess blood loss or blood transfusion
- Known thrombophilias
- Obesity (pre-pregnancy or early pregnancy BMI over 30 kg/m^2)
- One or more significant medical comorbidities (for example: heart disease; metabolic, endocrine or respiratory pathologies; acute infectious diseases; inflammatory conditions)
- Personal history or a first-degree relative with a history of VTE

- Pregnancy-related risk factor (such as ovarian hyperstimulation, hyperemesis gravidarum, multiple pregnancy or pre-eclampsia)
- Varicose veins with phlebitis [2010]

Consider offering combined VTE prophylaxis with mechanical methods and LMWH (or UFH for patients with severe renal impairment or established renal failure) to women who are pregnant or have given birth within the previous 6 weeks who are undergoing surgery, including caesarean section. [2010]

Offer mechanical and/or pharmacological VTE prophylaxis to women who are pregnant or have given birth within the previous 6 weeks only after assessing the risks and benefits and discussing these with the woman and with healthcare professionals who have knowledge of the proposed method of VTE prophylaxis during pregnancy and postpartum. Plan when to start and stop pharmacological VTE prophylaxis to minimise the risk of bleeding. [2010]

Critical Care

Assess all patients on admission to the critical care unit for their risks of VTE and bleeding (see "Assessing the Risks of VTE and Bleeding" above). Reassess patients' risks of VTE and bleeding daily and more frequently if their clinical condition is changing rapidly. [2010]

Offer VTE prophylaxis to patients admitted to the critical care unit according to the reason for admission, taking into account:

- Any planned interventions
- The use of other therapies that may increase the risk of complications [2010]

Review decisions about VTE prophylaxis for patients in critical care daily and more frequently if their clinical condition is changing rapidly. Take into account the known views of the patient, comments from their family and/or carers and the multidisciplinary team. [2010]

Patients Already Having Antiplatelet Agents or Anticoagulation on Admission or Needing Them for Treatment

Consider offering additional mechanical or pharmacological VTE prophylaxis to patients who are having antiplatelet agents to treat other conditions and who are assessed to be at increased risk of VTE. Take into account the risk of bleeding (see "Assessing the Risks of VTE and Bleeding" above) and of comorbidities such as arterial thrombosis.

- If the risk of VTE outweighs the risk of bleeding, consider offering pharmacological VTE prophylaxis according to the reason for admission.
- If the risk of bleeding outweighs the risk of VTE, offer mechanical VTE prophylaxis. [2010]

Do not offer additional pharmacological or mechanical VTE prophylaxis to patients who are taking vitamin K antagonists and who are within their therapeutic range, providing anticoagulant therapy is continued. [2010]

Do not offer additional pharmacological or mechanical VTE prophylaxis to patients who are having full anticoagulant therapy (for example, fondaparinux sodium, LMWH or UFH). [2010]

Patient Information and Planning for Discharge

Patient Information

Be aware that heparins are of animal origin and this may be of concern to some patients.[5] For patients who have concerns about using animal products, consider offering synthetic alternatives based on clinical judgement and after discussing their suitability, advantages and disadvantages with the patient. [2010]

Before starting VTE prophylaxis, offer patients and/or their families or carers verbal and written information on:

- The risks and possible consequences of VTE
- The importance of VTE prophylaxis and its possible side effects
- The correct use of VTE prophylaxis (for example, anti-embolism stockings, foot impulse or intermittent pneumatic compression devices)
- How patients can reduce their risk of VTE (such as keeping well hydrated and, if possible, exercising and becoming more mobile) [2010]

Planning for Discharge

As part of the discharge plan, offer patients and/or their families or carers verbal and written information on:

- The signs and symptoms of DVT and pulmonary embolism (PE)
- The correct and recommended duration of use of VTE prophylaxis at home (if discharged with prophylaxis)

- The importance of using VTE prophylaxis correctly and continuing treatment for the recommended duration (if discharged with prophylaxis)
- The signs and symptoms of adverse events related to VTE prophylaxis (if discharged with prophylaxis)
- The importance of seeking help and who to contact if they have any problems using the prophylaxis (if discharged with prophylaxis)
- The importance of seeking medical help and who to contact if DVT, PE or other adverse events are suspected [2010]

Ensure that patients who are discharged with anti-embolism stockings:

- Understand the benefits of wearing them
- Understand the need for daily hygiene removal
- Are able to remove and replace them, or have someone available who will be able to do this for them
- Know what to look for, such as skin marking, blistering or discolouration, particularly over the heels and bony prominences
- Know who to contact if there is a problem [2010]

Ensure that patients who are discharged with pharmacological and/or mechanical VTE prophylaxis are able to use it correctly, or have arrangements made for someone to be available who will be able to help them. [2010]

Notify the patient's general practitioner if the patient has been discharged with pharmacological and/or mechanical VTE prophylaxis to be used at home. [2010]

Footnotes

[1]Prescribers should consult the summary of product characteristics for the pharmacological VTE prophylaxis being used or planned for further details.

[2]At the time of publication (June 2015) some types of LMWH do not have UK marketing authorisation for VTE prophylaxis in medical patients. Prescribers should consult the summary of product characteristics for the individual LMWH. Informed consent for off-label use should be obtained and documented.

[3]In line with Dabigatran etexilate for the prevention of venous thromboembolism after hip or knee replacement surgery in adults (NICE technology appraisal guidance 157), dabigatran etexilate, within its marketing authorisation, is recommended as an option for the primary prevention of venous thromboembolic events in adults who have undergone elective total hip replacement surgery or elective total knee replacement surgery.

[4]In line with Rivaroxaban for the prevention of venous thromboembolism after total hip or total knee replacement in adults (NICE technology appraisal guidance 170), rivaroxaban, within its marketing authorisation, is recommended as an option for the prevention of VTE in adults having elective total hip replacement surgery or elective total knee replacement surgery.

[5]See Religion or belief: a practical guide for the NHS.

Definitions

Strength of Recommendations

Some recommendations can be made with more certainty than others. The Guideline Development Group (GDG) makes a recommendation based on the trade-off between the benefits and harms of an intervention, taking into account the quality of the underpinning evidence. For some interventions, the GDG is confident that, given the information it has looked at, most patients would choose the intervention. The wording used in the recommendations in this guideline denotes the certainty with which the recommendation is made (the strength of the recommendation).

Interventions That Must (or Must Not) Be Used

The GDG usually uses 'must' or 'must not' only if there is a legal duty to apply the recommendation. Occasionally the GDG uses 'must' (or 'must not') if the consequences of not following the recommendation could be extremely serious or potentially life threatening.

Interventions That Should (or Should Not) Be Used – a 'Strong' Recommendation

The GDG uses 'offer' (and similar words such as 'refer' or 'advise') when confident that, for the vast majority of patients, an intervention will do more good than harm, and be cost effective. The GDG uses forms of words (for example, 'Do not offer…') when confident that an intervention will not be of benefit for most patients.

Interventions That Could Be Used

The GDG uses 'consider' when confident that an intervention will do more good than harm for most patients, and be cost effective, but other options may be similarly cost effective. The choice of intervention, and whether or not to have the intervention at all, is more likely to depend on the patient's values and preferences than for a strong recommendation, and so the healthcare professional should spend more time considering and discussing the options with the patient.

Recommendation Wording in Guideline Updates

NICE began using this approach to denote the strength of recommendations in guidelines that started development after publication of the 2009 version of 'The guidelines manual' (January 2009). This does not apply to any recommendations ending [2010]. In particular, for recommendations labelled [2010] the word 'consider' may not necessarily be used to denote the strength of the recommendation.

Clinical Algorithm(s)

A National Institute for Health and Care Excellence (NICE) care pathway titled "Venous Thromboembolism Overview" is available from the NICE Web site .

Scope

Disease/Condition(s)

Venous thromboembolism (VTE) (deep vein thrombosis [DVT] and pulmonary embolism [PE])

Guideline Category

Management

Prevention

Risk Assessment

Treatment

Clinical Specialty

Anesthesiology

Cardiology

Colon and Rectal Surgery

Critical Care

Emergency Medicine

Family Practice

Hematology

Internal Medicine

Neurological Surgery

Obstetrics and Gynecology

Oncology

Orthopedic Surgery

Physical Medicine and Rehabilitation

Preventive Medicine

Pulmonary Medicine

Surgery

Thoracic Surgery

Urology

Intended Users

Advanced Practice Nurses

Hospitals

Nurses

Patients

Pharmacists

Physical Therapists

Physician Assistants

Physicians

Respiratory Care Practitioners

Guideline Objective(s)

2010 Guideline

To provide evidence-based recommendations on reducing the risk of venous thromboembolism (VTE) in patients admitted to hospital

2015 Update

To update recommendations on mechanical prophylaxis for VTE in patients who are admitted for stroke

Target Population

2010 Guideline

- Adults (18 years and older) admitted to hospital as inpatients or formally admitted to a hospital bed for day-case procedures, including:
  - Surgical inpatients
  - Inpatients with acute medical illness (for example, myocardial infarction, stroke, spinal cord injury, severe infection or exacerbation of chronic obstructive pulmonary disease)
  - Trauma inpatients
  - Patients admitted to intensive care units
  - Cancer inpatients
  - People undergoing long-term rehabilitation in hospital
  - Patients admitted to a hospital bed for day-case medical or surgical procedures
- Within this population, pregnant women admitted to hospital have been identified as a group requiring special consideration
- During the review of the evidence, any additional groups that are shown to have particular clinical needs will be given special consideration

Note: The following groups that will not be covered in this guideline:

- People younger than 18 years
- People attending hospital as outpatients
- People presenting to emergency departments without admission
- Elderly or immobile people cared for at home, or in external residential accommodation, unless admitted to hospital
- Patients admitted to hospital with a diagnosis of, or suspected diagnosis of, deep vein thrombosis (DVT) or pulmonary embolus

2015 Update

Patients admitted to hospital for stroke

Interventions and Practices Considered

1. Assessment of risk for venous thromboembolism (VTE) and bleeding
2. Reducing the risk of VTE
    - Avoiding dehydration
    - Encouraging mobilisation
    - Offering temporary inferior vena caval filters to patients who are at very high risk of VTE and for whom pharmacological interventions are contraindicated
3. Mechanical interventions for VTE prophylaxis
    - Anti-embolism stockings (thigh or knee length)
    - Intermittent pneumatic compression devices (thigh or knee length)
    - Foot-impulse devices
4. Pharmacological prophylaxis
    - Unfractionated heparin
    - Low molecular weight heparin
    - Fondaparinux sodium
    - Dabigatran etexilate
    - Rivaroxaban
5. Special considerations for medical, surgical, and other patient subgroups
6. Providing patient information and planning for discharge

Note: See the "Major Recommendations" field for recommendations concerning VTE risk assessment and prophylaxis in specific patient subgroups.

Major Outcomes Considered

- Primary outcomes
    - Deep vein thrombosis (DVT)
    - Pulmonary embolism (PE)
    - Major bleeding events
    - All-cause mortality
- Secondary outcomes
    - Post-thrombotic syndrome (PTS)
    - Chronic thromboembolic pulmonary hypertension (CTEPH)
    - Heparin-induced thrombocytopenia (HIT)
    - Neurological events
    - Quality of life
    - Survival
    - Length of hospital stay
- Cost-effectiveness

Methodology

Methods Used to Collect/Select the Evidence

Searches of Electronic Databases

Description of Methods Used to Collect/Select the Evidence

Note from the National Guideline Clearinghouse (NGC): This guideline was developed by the National Collaborating Centre for Acute and Chronic Conditions (NCC-ACC) on behalf of the National Institute for Health and Care Excellence (NICE). See the "Availability of Companion Documents" field for the full version of this guidance and for the addendum, which contains details and evidence used in the 2015 update.

2010 Guideline

Developing the Clinical Questions

Clinical questions were developed to guide the literature searching process and to facilitate the development of recommendations by the Guideline Development Group (GDG). The clinical questions were initially drafted by the review team and were refined and validated by the GDG. The questions were based on the scope (see Appendix A in the full guideline appendices [see the "Availability of Companion Documents" field]).

Clinical Literature Search

The aim of the literature search was to find evidence within the published literature in order to answer the clinical questions identified. Clinical databases were searched using filters (or hedges), using relevant medical subject headings and free-text terms. Non-English studies and abstracts were not reviewed. Searches were conducted to update the previous guideline.

Each database was searched up to 10 December 2008. One initial search was performed and then two update searches nearer the end of guideline development period. No papers after this date were considered. After the first draft of the guideline had been returned after stakeholder consultation a new study presenting results of the effectiveness of stockings in stroke patients was published in June 2009. This study reported new evidence on the use of stockings in stroke patients. The GDG decided the study should be included and felt that recommendations concerning the use of stockings should be reconsidered. To ensure all stockings studies published since the last searches in December 2008 were identified the search for evidence on stockings was updated to 9 June 2009.

The search strategies can be found in Appendix C in the full guideline appendices.

The following databases were searched:

- The Cochrane Library up to Issue 4 2008
- Medline 1950-2008 (OVID)
- EMBASE 1980-2008 (OVID)
- Cumulative Index to Nursing and Allied Health Literature (CINAHL) 1982-2008 (National Library for Health [NLH] Search 2.0)
- Health Economic and Evaluations Database (HEED) up to December 2008

There was no systematic attempt to search for grey literature or unpublished literature although all stakeholder references were followed up. Guidelines and reports via relevant Web sites including those listed below were also searched for.

- Members of the Guidelines International Network's Web sites (http://www.g-i-n.net/)
- NICE (www.nice.org.uk)
- NLH
- National Institutes of Health Consensus Development Program (http://consensus.nih.gov/)
- New Zealand Guidelines Development Group (NZGG) (http://www.nzgg.org.nz/)
- Scottish Intercollegiate Guideline Network (SIGN) (www.sign.ac.uk)
- National Guideline Clearinghouse (NGC) (www.guideline.gov)

Literature Reviewing Process

References identified by the systematic literature search were screened for appropriateness by title and abstract by an information scientist and

systematic reviewer. Studies were selected that reported one or more venous thromboembolism (VTE) outcome (deep vein thrombosis [DVT], pulmonary embolism [PE]) determined by objective/reliable methods. Reviewers did not select studies that reported only major bleeding outcomes, but where an included systematic review reported such studies, they were not removed. The GDG also suggested further references and these were assessed in the same way.

Selected studies were ordered and assessed in full by a systematic reviewer using agreed inclusion/exclusion criteria specific to the guideline topic, and using NICE methodology quality assessment checklists appropriate to the study design. These are described in the NICE guidelines manual (see the "Availability of Companion Documents" field).

Literature Review for Patient View Studies

Information of patient views regarding thromboprophylaxis and adherence are often more appropriately studied using non-randomised controlled trial (RCT) designs (i.e., qualitative studies, surveys of patients in observational studies). Unlike interventional studies, there is no established hierarchy of evidence to answer questions on patient views; observational or qualitative designs are not necessarily of lower quality than RCTs. Therefore, no study design limitation was included in the search and review of evidence. Relevant studies where the methods were clearly reported, appropriately designed to answer the study questions and met the quality assessment were included.

Health Economic Methods

Literature Review for Health Economics

Reviewers obtained published economic evidence from a systematic search of the following databases:

- The Cochrane Library up to Issue 4 2008
- Medline 1950-2008 (OVID)
- EMBASE 1980-2008 (OVID)
- HEED up to December 2008

The information specialists used the same search strategy as for the clinical questions, using an economics filter in the place of a systematic review or RCT filter. Each database was searched from its start date up to December 2008. Papers identified after this date were not considered. Search strategies can be found in Appendix C in the full guideline appendices.

Each search strategy was designed to find any applied study estimating the cost or cost-effectiveness of an included prophylaxis intervention. A health economist reviewed the abstracts. Relevant references in the bibliographies of reviewed papers were also identified and reviewed.

Papers were excluded from the review and evidence tables if:

- The population and interventions were covered by an original guideline cost-effectiveness analysis
- The study did not contain any original data on cost or cost-effectiveness (that is, it was a review or a clinical paper)
- The analysis was not incremental and was not described adequately to allow incremental analysis (so studies reporting only average cost-effectiveness ratios were excluded unless they provided data to allow the calculation of incremental cost-effectiveness ratios)
- Cost analyses were excluded if the results were not presented in a way that would allow the incremental cost per patient to be extracted or derived

2015 Update

The aim of the review was to assess the effectiveness of different mechanical methods of VTE prophylaxis (excluding elastic graduated compression stockings) in hospitalised stroke patients compared to no prophylaxis or routine care. A systematic search was conducted. An additional search was conducted using the same search terms with an economic filter to identify studies assessing the cost-effectiveness of mechanical prophylaxis of VTE.

See Appendices E and K in the Addendum document (see the "Availability of Companion Documents" field) for the clinical and health economic search strategies.

Number of Source Documents

2010 Guideline

Not stated

2015 Update

Clinical Evidence Review

The systematic search identified 1142 articles. The titles and abstracts were screened and 25 articles identified as potentially relevant. Full text versions of the articles were obtained and reviewed against the criteria specified in the review protocol (see Appendix D of the guideline addendum [see the "Availability of Companion Documents" field]). Three further articles of potential relevance were identified from other sources and retrieved: one from the National Institute for Health and Care Excellence (NICE) 4-year surveillance of CG92 conducted in June 2014, one from the reference list of a Cochrane review identified in the systematic search, and one recently published follow-up to a study included in this review, alerted by one of the topic expert members of the Committee. In total, 4 studies were included in the review, 3 of which were previously included in CG92. The flow chart for this review is in Appendix F of the guideline addendum.

Health Economics Evidence

The search retrieved 473 articles. The titles and abstracts were screened for possible inclusion and no articles were selected for further examination of the full-text version. An article on the 6 month follow-up of the CLOTS3 trial was included after the initial search. The article, published online in October 2014, was alerted by a topic expert member of the Committee who was one of the study authors. A review flowchart summarising the search and sifting process is provided in Appendix L of the guideline addendum.

Methods Used to Assess the Quality and Strength of the Evidence

Weighting According to a Rating Scheme (Scheme Given)

Rating Scheme for the Strength of the Evidence

2010 Guideline

Levels of Evidence for Intervention Studies

1++ High-quality meta-analyses, systematic reviews of randomised controlled trials (RCTs) or RCTs with a very low risk of bias

1+ Well-conducted meta-analyses, systematic reviews of RCTs, or RCTs with a low risk of bias

1– Meta-analyses, systematic reviews of RCTs, or RCTs with a high risk of bias

2++ High-quality systematic reviews of case–control or cohort studies. High-quality case–control or cohort studies with a very low risk of confounding, bias or chance and a high probability that the relationship is causal

2+ Well-conducted case–control or cohort studies with a low risk of confounding, bias or chance and a moderate probability that the relationship is causal

2– Case–control or cohort studies with a high risk of confounding, bias, or chance and a significant risk that the relationship is not causal

3 Non-analytical studies (e.g., case reports, case series)

4 Expert opinion, formal consensus

2015 Update

Overall Quality of Outcome Evidence in Grading of Recommendations Assessment, Development and Evaluation (GRADE)

Level	Description
High	Further research is very unlikely to change confidence in the estimate of effect.
Moderate	Further research is likely to have an important impact on confidence in the estimate of effect and may change the estimate.
Low	Further research is very likely to have an important impact on confidence in the estimate of effect and is likely to change the estimate.

Level	Description
Very Low	Any estimate of effect is very uncertain

Methods Used to Analyze the Evidence

Meta-Analysis

Meta-Analysis of Randomized Controlled Trials

Review of Published Meta-Analyses

Systematic Review with Evidence Tables

Description of the Methods Used to Analyze the Evidence

Note from the National Guideline Clearinghouse (NGC): This guideline was developed by the National Collaborating Centre for Acute and Chronic Conditions (NCC-ACC) on behalf of the National Institute for Health and Care Excellence (NICE). See the "Availability of Companion Documents" field for the full version of this guidance and for the addendum, which contains details and evidence used in the 2015 update.

2010 Guideline

Literature Reviewing Process

Literature Review for Patient View Studies

Qualitative studies were quality assessed using checklists from the NICE guideline manual (see the "Availability of Companion Documents" field) and only studies rated as '+' or '++' were included.

The questionnaires used in the various patient view studies found in the searches did not report on how they were designed and validated. This is a major methodological limitation for all studies using questionnaires in this guideline.

It is also important to note that both randomised controlled trials (RCTs) and observational studies of patient adherence come with potential biases and limitations. For example, the informed consent process and strict inclusion criteria of RCTs may contribute to better informed or motivated patients. In addition, participation in RCTs is usually associated with closer monitoring and better level of support. This may result in higher adherence than may be expected in routine practise. Adherence may also be higher in studies where patients were checked hourly for adherence or where self-reports were used. However, when a range of results are observed in different study designs and settings, these provide a useful indication of the types of issues that might be expected from the interventions in usual practice.

Methods for Combining Direct Evidence

Where possible, meta-analyses were conducted to combine the results of studies addressing the same clinical question using Cochrane's Review Manager Software. Random effects method (Der Simonian and Laird model) was used to calculate risk ratios (relative risk) of an event occurring, that is, all cause mortality, deep vein thrombosis (DVT), pulmonary embolism (PE) or major bleeding. Statistical heterogeneity was assessed by considering the chi-squared and the I-squared test. Significant heterogeneity was noted for any study where the I-squared value was >50%, or the I-squared value was between 25% and 50% and the chi-squared value was $p < 0.1$. Reviewers carried out sensitivity analyses to identify studies whose results were heterogeneous to the overall result. Any such studies were further assessed to identify any clinical or methodological causes. Reviewers avoided removing these studies from the meta-analyses unless a serious methodological flaw was identified, as removal would introduce bias into the systematic review.

Where combining results of trials in a meta-analysis was not appropriate a narrative synthesis of studies was undertaken.

Methods for Combining Direct and Indirect Evidence

It is difficult to determine the most effective prophylaxis strategy from the results of conventional meta-analyses of direct evidence for three reasons:

1. Some pairs of alternative strategies have not been directly compared in an RCT (for example, aspirin vs. fondaparinux).
2. Sometimes the direct evidence does not provide enough data and needs to be supported with indirect evidence.
3. There are frequently multiple overlapping comparisons (for example, heparin vs. no prophylaxis, heparin vs. stockings and stockings vs. no

prophylaxis), that potentially give inconsistent estimates of effect.

To overcome these problems, a network meta-analysis (NMA) was conducted that simultaneously pools together all the data. This allowed reviewers to rank the different prophylaxis interventions in order of efficacy at reducing DVTs and PEs and in order of risk of major bleeding. For each of these two outcomes, it gives a single estimate of effect (with confidence intervals [CIs]) for each intervention compared with no prophylaxis.

Refer to Section 3.10 in the full version of the guideline for a list of interventions that were included and excluded from the network meta-analysis.

The Model

A hierarchical Bayesian NMA method was performed using the software WinBUGS. This specific method is usually referred to as mixed-treatment comparisons analysis but the term network meta-analysis is used to refer generically to this kind of analysis. The term 'network' better describes the data structure, whereas 'mixed treatments' could easily be misinterpreted as referring to combinations of treatments.

Reviewers adapted a program on the University of Bristol Web site (https://www.bris.ac.uk/cobm/research/mpes/mixed-treatment-comparisons.html. Last accessed 20th January 2009). The model accounts for the correlation between arms in three-arm trials. Reviewers had no four-arm trials in their analysis.

In order to be included in the analysis, a fundamental requirement is that each treatment is connected directly or indirectly to every other intervention in the network. For each population subgroup reviewers have produced a diagram of the evidence network to show which interventions have been included. Trials with zero events in each arm were excluded since these do not contain evidence relevant to the analysis. This explains, in part at least, why there are far fewer trials in the NMAs of PE compared with the NMAs of DVT. Refer to Section 3.10 in the full version of the guideline for additional details on the NMAs.

Health Economic Methods

It is important to investigate whether health services are cost-effective (that is, value for money). If a particular prophylaxis or treatment strategy were found to yield little health gain relative to the resources used, then it would be advantageous to re-deploy resources to other activities that yield greater health gain.

2015 Update

Clinical Evidence

This update was developed based on the process and methods described in the NICE guidelines manual 2012 (see the "Availability of Companion Documents" field). Where there are deviations from the process and methods, these are clearly stated in the Interim process and methods guide for updates pilot programme 2013.

Methods

During development of the review protocol, the topic expert members of the Committee were asked to prioritise patient important outcomes for venous thromboembolism (VTE) prevention, ranking them from 1 (most important) to 7 (least important). Topic expert scores were compared and a final list of outcomes produced based on the average score. There was general consensus that development of symptomatic DVT and PE (fatal or non-fatal) were the most important outcomes for assessing effectiveness of VTE prophylaxis. For further information on the ranking of outcomes see Appendix C in the guideline addendum (see the "Availability of Companion Documents" field).

There is some debate in the medical literature about the relative importance (for risk of PE) of distal versus proximal DVT. However, this distinction was not made for either of the DVT outcomes specified by the topic experts. Evidence was therefore only evaluated where studies reported a combined measure of distal and proximal DVT, or a combined rate could be calculated for the treatment and control groups.

The review protocol is shown in Appendix D in the guideline addendum. Intermittent pneumatic compression (including foot impulse devices) and neuromuscular electrical stimulation (NMES) devices were identified as relevant interventions. Graduated compression stockings (GCS) were excluded because they are not recommended for use in acute stroke patients. However, studies comparing intermittent pneumatic compression or NMES used in conjunction with GCS (or with pharmacological prophylaxis) were eligible for inclusion if the comparison enabled the effect of intermittent pneumatic compression or NMES alone to be assessed (for example, 'intermittent pneumatic compression + stockings' vs 'stockings alone'). Other relevant comparators were routine care/no VTE prophylaxis.

Evidence Appraisal

The quality of evidence was appraised for each important outcome using the criteria recommended by the Grading of Recommendations, Assessment, Development and Evaluation (GRADE) Working Group. See the guideline addendum for further details on evaluating risk of bias, indirectness, inconsistency, and imprecision for the update evidence.

Statistical Analyses

Two trials included a post-treatment follow-up period (3 months and 6 months respectively). For these two studies, pooled data for DVT and all-cause mortality were meta-analysed using Review Manager 5 over three time points: (i) treatment period only, (ii) cumulative treatment + follow-up period, and (iii) post-treatment follow-up period only. These analyses may inform whether the effect of mechanical prophylaxis is merely to defer VTE events (in which case, the treatment group would be expected to show a differential increase in the post-treatment period), and whether any benefit of mechanical prophylaxis is sustained beyond the treatment phase (in which case, effect estimates would continue to favour the treatment group).

One large study reported relative risk ratios and 95% CI adjusted for four baseline variables that may be associated with VTE outcomes. These adjusted data are likely to be a more precise estimate of the true effect of mechanical prophylaxis so they were inputted (in preference to simple event rate data) into Review Manager 5, where available, for the dichotomous outcomes. The Generic Inverse Variance method used to do this generates forest plot output where the point estimate appears in red (for example, see Figure 2 in the guideline addendum). Where adjusted data were not available, event rates were inputted using the Mantel-Haenszel method, generating forest plot output in blue (for example, see Figure 3 in the guideline addendum). A fixed effects model was used for all analyses because of the small number of studies.

There were not sufficient data across studies to do the subgroup analyses specified in the review protocol (see Appendix D in the guideline addendum). However, one large multi-centre trial had undertaken some relevant pre-specified subgroup comparisons where the primary outcome was proximal DVT (symptomatic or asymptomatic). There are presented in Table 10 and forest plot Figures 18-22 in the addendum to inform decision-making.

For a summary of included studies please see Table 2 in the guideline addendum. For the full evidence tables and full GRADE profiles please see Appendices H and I in the guideline addendum.

Economic Evidence

An economic evaluation was conducted by the CLOTS Trials Collaboration based on the data collected during the CLOTS3 trial.

Methods Used to Formulate the Recommendations

Expert Consensus

Expert Consensus (Nominal Group Technique)

Description of Methods Used to Formulate the Recommendations

Note from the National Guideline Clearinghouse (NGC): This guideline was developed by the National Collaborating Centre for Acute and Chronic Conditions (NCC-ACC) on behalf of the National Institute for Health and Care Excellence (NICE). See the "Availability of Companion Documents" field for the full version of this guidance and for the addendum, which contains details and evidence used in the 2015 update.

2010 Guideline

A multidisciplinary Guideline Development Group (GDG) comprising professional group members and consumer representatives of the main stakeholders developed this guideline (see section on Guideline Development Group Membership and acknowledgements in the full version of the guideline).

NICE funds the National Clinical Guideline Centre for Acute and Chronic Conditions, NCGC (formerly the National Collaborating Centre for Acute Care, NCC-AC) and thus supported the development of this guideline. The GDG was convened by the NCC-AC in accordance with guidance from NICE. The GDG met every 6 to 8 weeks during the development of the guideline.

A separate orthopaedic subgroup was set up in March 2008 to provide specific expert guidance on venous thromboembolism (VTE) prophylaxis for patients having orthopaedic surgery. This group comprised seven consultant orthopaedic surgeons representing a range of orthopaedic specialties along with a patient representatives and a nursing representative. The group met 5 times. This orthopaedic subgroup group reviewed the

evidence for orthopaedic surgery and provided expert opinion and draft recommendations to the main GDG. The full GDG had the responsibility for final approval of all recommendations in the guideline.

Staff from the NCGC provided methodological support and guidance for the development process. They undertook systematic searches, retrieval and appraisal of the evidence and drafted the guideline.

See Section 3.3 in the full version of the guideline for information on developing the clinical questions.

Development of Recommendations

Over the course of the guideline development process the GDG was presented with the following:

- Evidence tables and narrative summaries of the clinical evidence reviewed. All evidence tables are in Appendix D in the full guideline appendices (see "Availability of Companion Documents" field).
- Forest plots of direct meta-analysis (Appendix E in the full guideline appendices)
- Forest plots of network meta-analysis (Chapters 9 to 12, 23 in the full version of the guideline)
- A description of the methods for, and results of, the cost-effectiveness analysis (Chapter 4 and Chapters 9 to 12, 23 in the full version of the guideline)

Although evidence was reviewed for every population, network meta-analysis and cost-effectiveness analysis were only conducted for 5 populations, general medical patients, general surgical patients, hip fracture surgery, total hip replacement and total knee replacement. For these populations the recommendations were derived directly from the results of the analyses. If the decision was taken not to recommend the most cost effective strategy the GDG clearly explained their reasoning for this.

For populations which did not have cost effectiveness models conducted, recommendations were based on the direct evidence available for that population and from extrapolating the results from cost-effectiveness models in other populations. The link between evidence and the subsequent recommendations is explained in the relevant sections.

2015 Update

The NICE guideline Venous thromboembolism: reducing the risk in patients admitted to hospital (NICE clinical guideline 92) was reviewed in 2013 as part of NICE's routine surveillance programme to decide whether it required updating. The surveillance report identified new evidence relating to following area of the guidance:

- Intermittent pneumatic compression in people admitted to hospital with recent stroke

The guideline was updated using a standing committee of healthcare professionals, research methodologists and lay members from a range of disciplines and localities. For the duration of the update the core members of the Committee were joined by up to 5 additional members who have specific expertise in the topic being updated.

This update was developed based on the process and methods described in the NICE guidelines manual 2012 (see the "Availability of Companion Documents" field). Where there are deviations from the process and methods, these are clearly stated in the Interim process and methods guide for updates pilot programme 2013.

Rating Scheme for the Strength of the Recommendations

2010 Guideline

Not applicable

2015 Update

Strength of Recommendations

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Interventions That Must (or Must Not) Be Used

The GDG usually uses 'must' or 'must not' only if there is a legal duty to apply the recommendation. Occasionally the GDG uses 'must' (or 'must not') if the consequences of not following the recommendation could be extremely serious or potentially life threatening.

Interventions That Should (or Should Not) Be Used – a 'Strong' Recommendation

The GDG uses 'offer' (and similar words such as 'refer' or 'advise') when confident that, for the vast majority of patients, an intervention will do more good than harm, and be cost effective. The GDG uses similar forms of words (for example, 'Do not offer…') when confident that an intervention will not be of benefit for most patients.

Interventions That Could Be Used

The GDG uses 'consider' when confident that an intervention will do more good than harm for most patients, and be cost effective, but other options may be similarly cost effective. The choice of intervention, and whether or not to have the intervention at all, is more likely to depend on the patient's values and preferences than for a strong recommendation, and so the healthcare professional should spend more time considering and discussing the options with the patient.

Recommendation Wording in Guideline Updates

NICE began using this approach to denote the strength of recommendations in guidelines that started development after publication of the 2009 version of 'The guidelines manual' (January 2009). This does not apply to any recommendations ending [2010]. In particular, for recommendations labelled [2010] the word 'consider' may not necessarily be used to denote the strength of the recommendation.

Cost Analysis

2010 Guideline

In this guideline an original cost-effectiveness analysis was performed which compared a variety of different prophylactic strategies for a number of different hospital population subgroups. In addition, a systematic review of the economic literature was conducted for populations or interventions not covered by the original cost-effectiveness analysis.

The criteria applied for an intervention to be considered cost-effective were either:

a. The intervention dominated other relevant strategies (that is, it is both less costly in terms of resource use and more clinically effective compared with all the other relevant alternative strategies), or
b. The intervention cost less than £20,000 per quality-adjusted life-year (QALY) gained compared with the next best strategy (and compared with no prophylaxis).

The full economic evaluation of any strategy has to be in comparison with another strategy:

- Incremental cost: the mean cost of one strategy minus the mean cost of a comparator study
- QALYs gained: the mean QALYs associated one strategy minus the mean QALYs of a comparator study
- Incremental cost-effectiveness ratio: the incremental cost divided by the respective QALYs gained
- Incremental net benefit (INB): the (monetary) value of a strategy compared with an alternative strategy for a given cost-effectiveness threshold (For example: £20,000 per QALY gained)

In the cost-effectiveness analysis (see Chapter 4 in the full version of the guideline), the following formula was used to estimate the INB of each strategy:

INB = (QALYs gained compared with no prophylaxis x £20,000) minus the incremental cost compared with no prophylaxis.

This indicates that to £20,000 will be invested to gain one additional QALY. The strategy that has the highest INB is the optimal (that is, most cost-effective) strategy. Strategies that have a negative INB are not cost-effective even compared with no prophylaxis.

Cost-effectiveness Modelling

The following general principles were adhered to:

- The Guideline Development Group (GDG) was consulted during the construction and interpretation of the model.
- The model was based on a network meta-analysis derived from the systematic review of clinical evidence.
- Model assumptions were reported fully and transparently (see Chapter 4 in the full version of the guideline).

- The results were subject to thorough sensitivity analysis and limitations discussed.
- Costs were calculated from a health services perspective.

Also see "Economic Considerations" for each recommendation in the full version of the guideline for conclusions derived from economic modeling.

2015 Update

Economic Evidence

An economic evaluation was conducted by the CLOTS Trials Collaboration based on the data collected during the CLOTS3 trial. Over a 6 month timeframe there was a mean difference in quality-adjusted survival of 0.9 days in favour of the intermittent pneumatic compression IPC group but this was not statistically significant with a 95% confidence interval (CI) of -2.1 to 3.9 days. The CLOTS3 authors found that the intermittent pneumatic compression arm was associated with an increased cost of £451. The majority of this cost difference (£387) was calculated using the mean difference in length of stay of 1.8 days (95% CI -1.0 to 4.5). The CLOTS3 authors reported an incremental cost-effectiveness ratio of £610.88 per quality-adjusted life day with a high degree of uncertainty around this estimate. The CLOTS3 authors also reported the direct treatment cost of avoiding the conditions related to venous thromboembolism (VTE).

See Section 2.4.1 in the guideline addendum (see the "Availability of Companion Documents" field) for additional details.

Method of Guideline Validation

External Peer Review

Internal Peer Review

Description of Method of Guideline Validation

2010 Guideline

Validation of Guideline

Registered stakeholders were given the opportunity to comment on the draft guideline, which was posted on the National Institute for Health and Care Excellence (NICE) Web site. A Guideline Review Panel also reviewed the guideline and checked that stakeholders' comments had been addressed.

A second consultation was conducted because the results of a large randomised controlled trial (RCT) was published after the first consultation. As a result of the second consultation, some changes were made for the General Medical Patients (Chapter 23 in the full version of the guideline) and Stroke Patients (Chapter 24 in the full version of the guideline) recommendations.

2015 Update

Not stated

Evidence Supporting the Recommendations

Type of Evidence Supporting the Recommendations

The type of evidence supporting the recommendations is not specifically stated.

The type and quality of evidence for each recommendation is described in the relevant sections of the full version of the guideline and the guideline addendum (see the "Availability of the Companion Documents" field).

Benefits/Harms of Implementing the Guideline Recommendations

Potential Benefits

Reducing the risk of venous thromboembolism (VTE) and its associated short and long term consequences and reducing unwanted effects of thromboprophylaxis methods are the most important outcomes. Increased patient awareness, adherence and correct use of prophylaxis methods could lead to a reduction in these VTE outcomes as well as improving the patient's experience and satisfaction.

Refer to the "Trade-off between clinical benefits and harms" sections of the full version of the guideline and the "Trade-off between benefits and harms" sections of the 2015 addendum (see the "Availability of Companion Documents" field) for benefits of specific interventions.

Potential Harms

- For each of the recommendations about providing prophylaxis the potential benefits of reducing the risk of venous thromboembolism (VTE) events (symptomatic deep vein thrombosis [DVT], symptomatic pulmonary embolism [PE] and fatal PE) needs to be balanced against the potential harms of bleeding events (major bleeding, fatal bleeding and stroke).
- The timing of when pharmacological prophylaxis is started is particularly important in patients who have suffered a spontaneous or traumatic haemorrhage. The risk of bleeding is a serious complication in patients requiring emergency cranial or spinal surgery. In spinal surgery the catastrophic long term neurological consequences of extradural bleeding need to be balanced against the risk to life of VTE disease.
- An additional concern is the risk of developing an epidural haematoma as a result of the regional anaesthetic technique. Consequently, the Guideline Development Group (GDG) recommends that the timing of pharmacological prophylaxis should be carefully planned to minimise the risk of spinal haematoma if a regional anaesthetic technique is used. Patients using antiplatelets or anticoagulant agents may be at increased risk of bleeding.
- Poorly fitted stockings or those of an incorrect shape and size have the potential to cause a tourniquet effect on the proximal part of the limb where the stocking is applied. This can result in ischaemia and an increased risk of thrombosis development.
- Unlike pharmacological prophylaxis, mechanical methods do not increase the risk of bleeding. However, anti-embolism stockings have been shown to be ineffective in reducing the risk of VTE in stroke patients and were associated with an increased risk of cutaneous adverse reactions.
- Foot impulse or intermittent pneumatic compression devices do not increase the risk of bleeding but may cause damage to the skin.
- Although overall incidence was relatively low and no serious complications (such as amputation) were reported, intermittent pneumatic compression was associated in the CLOTS3 trial with a significant increase in skin necrosis (3.1% versus 1.4%). The Committee noted that skin breaks are a less important outcome than others under consideration, but may necessitate stopping intermittent pneumatic compression and can be potentially difficult to treat in immobile older patients.

Refer to the "Trade-off between clinical benefits and harms" sections of the full version of the guideline and the "Trade-off between benefits and harms" sections of the 2015 addendum (see the "Availability of Companion Documents" field) for additional details on harms of specific interventions.

Contraindications

Contraindications

- Anti-embolism stockings are contraindicated in patients with peripheral arterial disease, arteriosclerosis, severe peripheral neuropathy, massive leg oedema or pulmonary oedema, oedema secondary to congestive cardiac failure, local skin/soft tissue diseases such as recent skin graft or dermatitis, extreme deformity of the leg, gangrenous limb and Doppler pressure index <0.8, or cellulitis.
- The use of intermittent compression devices is contraindicated in patients with peripheral arterial disease.
- The use of intermittent compression devices and anti-embolism/graduated compression stockings will usually be inappropriate on the operated leg for a patient undergoing lower limb arterial surgery.
- Pharmacological prophylaxis may be contraindicated in certain patients because of increased risk of bleeding.

Qualifying Statements

Qualifying Statements

- This guidance represents the view of the National Institute for Health and Care Excellence (NICE), which was arrived at after careful consideration of the evidence available. Healthcare professionals are expected to take it fully into account when exercising their clinical judgement. However, the guidance does not override the individual responsibility of healthcare professionals to make decisions appropriate to the circumstances of the individual patient, in consultation with the patient and/or guardian or carer, and informed by the summary of product characteristics of any drugs they are considering.
- Implementation of this guidance is the responsibility of local commissioners and/or providers. Commissioners and providers are reminded that it is their responsibility to implement the guidance, in their local context, in light of their duties to have due regard to the need to eliminate unlawful discrimination, advance equality of opportunity and foster good relations. Nothing in this guidance should be interpreted in a way that would be inconsistent with compliance with those duties.
- The guideline will assume that prescribers will use a drug's summary of product characteristics to inform decisions made with individual patients.
- This guideline recommends some medicines for indications for which they do not have a UK marketing authorisation at the date of publication, if there is good evidence to support that use. The prescriber should follow relevant professional guidance, taking full responsibility for the decision. The patient (or those with authority to give consent on their behalf) should provide informed consent, which should be documented. See the General Medical Council's Good practice in prescribing and managing medicines and devices for further information. Where recommendations have been made for the use of medicines outside their licensed indications ('off-label use'), these medicines are marked with a footnote in the recommendations.
- See the "Person-centred care" section in the original guideline document for information about individual needs and preferences and transition of care.

Implementation of the Guideline

Description of Implementation Strategy

Implementation tools and resources to help put the guideline into practice are available (see also the "Availability of Companion Documents" field).

The following recommendations were identified as priorities for implementation in the 2010 guideline and have not been changed in the 2015 update.

Key Priorities for Implementation

Assessing the Risks of Venous Thromboembolism (VTE) and Bleeding

Assess all patients on admission to identify those who are at increased risk of VTE. [2010]

Regard medical patients as being at increased risk of VTE if they:

- Have had or are expected to have significantly reduced mobility for 3 days or more or
- Are expected to have ongoing reduced mobility relative to their normal state and have one or more of the risk factors shown in Box 1 (see the "Major Recommendations" field) [2010]

Regard surgical patients and patients with trauma as being at increased risk of VTE if they meet one of the following criteria:

- Surgical procedure with a total anaesthetic and surgical time of more than 90 minutes, or 60 minutes if the surgery involves the pelvis or lower limb
- Acute surgical admission with inflammatory or intra-abdominal condition
- Expected significant reduction in mobility
- One or more of the risk factors shown in Box 1 (see the "Major Recommendations" field) [2010]

Assess all patients for risk of bleeding before offering pharmacological VTE prophylaxis.[1] Do not offer pharmacological VTE prophylaxis to patients with any of the risk factors for bleeding shown in Box 2 (see the "Major Recommendations" field), unless the risk of VTE outweighs the risk of bleeding. [2010]

Reassess patients' risks of bleeding and VTE within 24 hours of admission and whenever the clinical situation changes, to:

- Ensure that the methods of VTE prophylaxis being used are suitable
- Ensure that VTE prophylaxis is being used correctly
- Identify adverse events resulting from VTE prophylaxis [2010]

Reducing the Risk of VTE

Encourage patients to mobilise as soon as possible. [2010]

Offer pharmacological VTE prophylaxis to general medical patients assessed to be at increased risk of VTE. Choose any one of:

- Fondaparinux sodium
- Low molecular weight heparin (LMWH)[2]
- Unfractionated heparin (UFH) (for patients with severe renal impairment or established renal failure) [2010]

Start pharmacological VTE prophylaxis as soon as possible after risk assessment has been completed. Continue until the patient is no longer at increased risk of VTE. [2010]

Patient Information and Planning for Discharge

Before starting VTE prophylaxis, offer patients and/or their families or carers verbal and written information on:

- The risks and possible consequences of VTE
- The importance of VTE prophylaxis and its possible side effects
- The correct use of VTE prophylaxis (for example, anti-embolism stockings, foot impulse or intermittent pneumatic compression devices)
- How patients can reduce their risk of VTE (such as keeping well hydrated and, if possible, exercising and becoming more mobile) [2010]

As part of the discharge plan, offer patients and/or their families or carers verbal and written information on:

- The signs and symptoms of deep vein thrombosis (DVT) and pulmonary embolism (PE)
- The correct and recommended duration of use of VTE prophylaxis at home (if discharged with prophylaxis)
- The importance of using VTE prophylaxis correctly and continuing treatment for the recommended duration (if discharged with prophylaxis)
- The signs and symptoms of adverse events related to VTE prophylaxis (if discharged with prophylaxis)
- The importance of seeking help and who to contact if they have any problems using the prophylaxis (if discharged with prophylaxis)
- The importance of seeking medical help and who to contact if DVT, PE or another adverse event is suspected [2010]

[1]Prescribers should consult the summary of product characteristics for the pharmacological VTE prophylaxis being used or planned for further details.

[2]At the time of publication (June 2015) some types of LMWH do not have UK marketing authorisation for VTE prophylaxis in medical patients. Prescribers should consult the summary of product characteristics for the individual LMWH. Informed consent for off-label use should be obtained and documented.

Implementation Tools

Audit Criteria/Indicators

Clinical Algorithm

Foreign Language Translations

Mobile Device Resources

Patient Resources

Resources

Slide Presentation

Staff Training/Competency Material

For information about availability, see the *Availability of Companion Documents* and *Patient Resources* fields below.

Institute of Medicine (IOM) National Healthcare Quality Report Categories

IOM Care Need

Staying Healthy

IOM Domain

Effectiveness

Patient-centeredness

Safety

Timeliness

Identifying Information and Availability

Bibliographic Source(s)

National Clinical Guideline Centre for Acute and Chronic Conditions. Venous thromboembolism in adults admitted to hospital: reducing the risk. London (UK): National Institute for Health and Care Excellence (NICE); 2015 Jun. 62 p. (Clinical guideline; no. 92).

Adaptation

Not applicable: The guideline was not adapted from another source.

Date Released

2007 Apr (revised 2015 Jun)

Guideline Developer(s)

National Clinical Guideline Centre for Acute and Chronic Conditions - National Government Agency [Non-U.S.]

Source(s) of Funding

National Institute for Health and Care Excellence (NICE)

Guideline Committee

Guideline Development Group

Composition of Group That Authored the Guideline

2010 Guideline

Guideline Development Group Members: Professor Tom Treasure (*Chair*), Honorary Professor and Honorary Consultant, Clinical Operational Research Unit, University College London; Mrs Kim Carter, DVT Nurse Specialist, Portsmouth Hospitals NHS Trust, Queen Alexandra Hospital, Portsmouth; Dr Nandan Gautam, Consultant in General Medicine and Critical Care, Selly Oak Hospital, Birmingham; Professor Aroon Hingorani, Professor of Genetic Epidemiology, British Heart Foundation Senior Research Fellow, and Honorary Consultant Physician, University College London Hospitals NHS Foundation Trust; Dr Rodney Hughes, Consultant Respiratory Physician, Northern General Hospital, Sheffield; Professor Beverley Hunt, Consultant in Departments of Haematology, Pathology and Rheumatology, Guy's and St. Thomas' Foundation Trust, London; Dr Nigel Langford, Consultant Physician and Clinical Pharmacologist, City Hospital, Birmingham; Mr Paul Mainwaring, Patient representative, Bury; Mr Donald McBride, Consultant Orthopaedic Surgeon, University Hospital North Staffordshire; Gordon McPherson, Patient representative, Renfrewshire; Dr Simon Noble, Clinical Senior Lecturer and Honorary Consultant in Palliative Medicine, Royal Gwent Hospital, Newport; Professor Gerard Stansby, Professor of Vascular Surgery, Freeman Hospital, Newcastle upon Tyne; Dr Peter Walton, Patient representative, Cheshire; Ms Annie Young, Nurse Director, 3 Counties Cancer Network, Gloucestershire, Herefordshire and South Worcestershire

2015 Update

Clinical Guidelines Update Team: Philip Alderson, Clinical Adviser; Nicole Elliott, Associate Director; Jennifer Craven, Information Scientist; Susannah Moon, Programme Manager; Rebecca Parsons, Project Manager; Nicki Mead, Technical Analyst; Toni Tan, Technical Advisor

Standing Committee: Members of Standing Committee B and the topic experts for the 2015 update are listed on the NICE Web site .

Financial Disclosures/Conflicts of Interest

2010 Guideline

At the start of the guideline development process all Guideline Development Group (GDG) members declared interests including consultancies, fee-paid work, share-holdings, fellowships and support from the healthcare industry. At all subsequent GDG meetings, members declared arising conflicts of interest, which were also reported (see Appendix B in the full guideline appendices [see "Availability of Companion Documents" field]). Members are either required to withdraw completely or for part of the discussion if their declared interest makes it appropriate; however, this was not deemed necessary for any group members on this guideline.

2015 Update

See Section 4.4 in the original guideline document for declarations of interests of Standing Committee members. All other members stated that they had no interests to declare.

Guideline Status

This is the current release of the guideline.

This guideline updates a previous version: National Collaborating Centre for Acute and Chronic Conditions. Venous thromboembolism: reducing the risk. Reducing the risk of venous thromboembolism (deep vein thrombosis and pulmonary embolism) in patients admitted to hospital. London (UK): National Institute for Health and Clinical Excellence (NICE); 2010 Jan. 50 p. (Clinical guideline; no. 92).

This guideline meets NGC's 2013 (revised) inclusion criteria.

Guideline Availability

Available from the National Institute for Health and Care Excellence (NICE) Web site .

Availability of Companion Documents

The following are available:

- Venous thromboembolism: reducing the risk of venous thromboembolism (deep vein thrombosis and pulmonary embolism) in patients admitted to hospital. Full guideline. London (UK): National Institute for Health and Care Excellence (NICE); 2010 Jan. 519 p. (Clinical guideline; no. 92). Available from the National Institute for Health and Care Excellence (NICE) Web site .
- Venous thromboembolism: reducing the risk of venous thromboembolism (deep vein thrombosis and pulmonary embolism) in patients admitted to hospital. Appendices A–D. National Institute for Health and Care Excellence (NICE); 2010 Jan. 552 p. (Clinical guideline; no. 92). Available from the NICE Web site .
- Venous thromboembolism: reducing the risk of venous thromboembolism (deep vein thrombosis and pulmonary embolism) in patients admitted to hospital. Appendices E–I. National Institute for Health and Care Excellence (NICE); 2010 Jan. 196 p. (Clinical guideline; no. 92). Available from the NICE Web site .
- Addendum to clinical guideline CG92, venous thromboembolism in adults admitted to hospital: reducing the risk (chapter 24 – stroke patients). London (UK): National Institute for Health and Care Excellence (NICE); 2015 Jun. 93 p. (Clinical guideline addendum no. 92.1). Available from the NICE Web site .
- Venous thromboembolism: reducing the risk. Evidence update February 2012. A summary of selected new evidence relevant to NICE clinical guideline 92 'Reducing the risk of venous thromboembolism (deep vein thrombosis and pulmonary embolism) in patients admitted to hospital' (2010). National Institute for Health and Care Excellence (NICE); 2012 Feb. 22 p. (Clinical guideline; no. 92). Available from the NICE Web site .
- Venous thromboembolism in adults admitted to hospital: reducing the risk. Audit support. London (UK): National Institute for Health and Care Excellence (NICE); 2014 Nov. 26 p. (Clinical guideline; no. 92). Available from the NICE Web site .
- Venous thromboembolism in adults admitted to hospital: reducing the risk. Slide set. London (UK): National Institute for Health and Care Excellence (NICE); 2010 Jan. 25 p. (Clinical guideline; no. 92). Available from the NICE Web site .
- Venous thromboembolism in adults admitted to hospital: reducing the risk. Baseline assessment tool. London (UK): National Institute for Health and Care Excellence (NICE); 2015 Jun. (Clinical guideline; no. 92). Available from the NICE Web site .
- Venous thromboembolism in adults admitted to hospital: reducing the risk. Online education tool. London (UK): National Institute for Health and Care Excellence (NICE); 2010 Sep. (Clinical guideline; no. 92). Available from the NICE Web site .
- The guidelines manual 2012. London (UK): National Institute for Health and Care Excellence (NICE); 2012 Nov. Available from the NICE Web site .

Patient Resources

The following is available:

- Venous thromboembolism in adults admitted to hospital: reducing the risk. Information for the public. London (UK): National Institute for Health and Care Excellence (NICE); 2010 Jan. 16 p. (Clinical guideline; no. 92). Available from the National Institute for Health and Care Excellence (NICE) Web site . Also available for download in ePub and eBook formats from the NICE Web site . Also available in Welsh from the NICE Web site .

Please note: This patient information is intended to provide health professionals with information to share with their patients to help them better understand their health and their diagnosed disorders. By providing access to this patient information, it is not the intention of NGC to provide specific medical advice for particular patients. Rather we urge patients and their representatives to review this material and then to consult with a licensed health professional for evaluation of treatment options suitable for them as well as for diagnosis and answers to their personal medical questions. This patient information has been derived and prepared from a guideline for health care professionals included on NGC by the authors or publishers of that original guideline. The patient information is not reviewed by NGC to establish whether or not it accurately reflects the original guideline's content.

NGC Status

This NGC summary was completed by ECRI Institute on November 13, 2009. This summary was updated by ECRI Institute on January 13, 2010. This summary was updated by ECRI Institute on January 23, 2013 following the U.S. Food and Drug Administration advisory on Pradaxa (dabigatran etexilate mesylate). This summary was updated by ECRI Institute on March 7, 2014 following the U.S. Food and Drug Administration advisory on Low Molecular Weight Heparins. This summary was updated by ECRI Institute on August 31, 2015.

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